A SYNOPSIS

ENTITLED

STUDIES ON SEED BORNE FUNGAL DISEASES OF RICE (*ORYZA SATIVA*) AND THEIR MANAGEMENT

Submitted by

Mrs.Umme Tameem

Research Scholar

For the degree of

Doctor of philosophy in Botany

In

Faculty of Science

To

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,

NANDED

Under the guidance of

Dr. N. Jagan Mohan Reddy

Professor & Head

P.G. Department of Botany,

Shri Shivaji College, Kandhar 431714

Dist.Nanded (M.S.) India.

June 2017

STUDIES ON SEED BORNE FUNGAL DISEASES OF RICE (*ORYZA SATIVA*) AND THEIR MANAGEMENT

Introduction:

Seed borne diseases have been found to affect the growth and productivity of crop plants. A seed borne pathogen present externally or internally or associated with seed as contaminant may cause seed abortion , seed rot , seed necrosis , reduction or elimination of germination capacity as well as seedling damage resulting in development of disease at later stages of plant growth by systemic or local infection. Seeds are regarded as highly effective means for transporting plant pathogens over long distances. Besides, the mold fungi which grow on the seed substratum produce mycotoxins which are hazardous to humans and animals.(Halt , 1994) . Fungi are one of the factors in storage seeds which reduce seed viability . Seed borne fungal diseases are the most limiting factor . Fungi form a major group of pathogens that can be seed borne or transmitted to seeds. Seed borne diseases caused by fungi are relatively difficult to control as the fungal hyphae get established and become dormant. If seeds infected or contaminated by a pathogen that is also seed borne , is sown in non infected soil , they may be established in that soil.

Cereals have been important crops for thousands of years. These are the most significant food to the man. These are cultivated members of the grass family and as such monocotyledonous angiosperms and their characteristic fruit is caryopsis in which pericarp remains entirely fused with seed coat. Cereals represents 60% of calories and proteins consumed by human beings . They are rich in carbohydrates , proteins , oils , and vitamins . Moisture content of cereals is very low and as such they may be stored for long periods without deterioration . Propagation of cereals is mainly by means of seeds. Cereals such as rice , wheat and maize are particularly important to humans because of their role as staple food crops in many areas of the world. Cereals are also used to produce animal feed , oils , starch , flour , sugar , syrup, processed foods , malt , alcoholic beverages , gluten and renewable energy.

Rice / Paddy (*Oryza sativa L*) : *–Oryza satva.L var.sativa* ; *Oryza sativa sensu* Hook . f.
Family: Poacae.
Tel : Vari , Vadlu , Nelli ; Hindi: Chauval ; Eng : Paddy , Rice plant , Rice grass

Morphology : Flower and Fruit : August to February .

Lemmas excluding its awn , punctuate or granulate , not winged on the back ; panicles compound ; spikelet’s numerous ; glooms oblong ; cultivated .Animal cultivated herbs , culms creeping or floating at base ; nodes glabrous . Leaf blades linear , flat , acuminate , base rounded , margin scab rid , midrib prominent , sheaths glabrous ligules membranous , 2-partite . panicle lax , compounds . spikelet’s linear – oblong numerous awnless. glumes oblong , scaly 1-

nerved ; lemma boat shaped , coriaceous , puncktate , dorsally ciliate , 3-nerved ; palea linear , scabrid on the outer surface . stamens 6 . caryopsis oblong , compressed .

Uses : Root-aphrodisiac , diuretic galactagogue , vomiting , piles . seed-abdominal disorders , fainting , debility ,lung diseases , diarrhea , dysentery (Dr. K. Madhava Chetty et. al.)

Few varieties of rice (*Oryza sativa L)* grown in Telangana region are I R 64, swarna (MTU 7029) , Sambamashuri (BPT 5204) , Surekha (IET 7946) , Kesava (WGL3825) , divya (WGL 44645) , Vajram (MTU 5249), Godhavari (MTU 1032) , Bapatla (Sannalu) Similarly topsin and mencozeb suppressed the growth of *Curvularia sp* . by 50% (A.R. Butt *et.al*) .

Rice is the seed of the grass species *Oryza sativa L (*Asian rice). As a cereal grain rice is the worlds most important food crop second to wheat , feeding over two billion people in Asia alone. It is also an important commercial crop ranks as one of the major foreign exchange earners after cotton crop (A.R. Butt et.al.,2011) .

The rice plant is an annual grass . It normally grows for only a year and then dies , with round , hollow , jointed culms (stems) , flat leaves , and a terminal panicle (flower cluster) . It is the only cultivated cereal plant adapted to growing in both flooded and non flooded soil . Grown under a wide range of climatic and geographical conditions on all five continents the grain is the seed of the rice plant , a fertilized and ripened ovule containing a live embryo capable of germinating to produce a new plant. The grain consist largely of endosperm – the edible portion , containing starch , proteins , sugar , fats , crude fiber and inorganic matter .

Rice is a staple food of India and several countries of south east Asia . Greek literature indicates that rice is indigenous crop of India. It was introduced to Europe from India by Alexander the great in 300 AD and cultivation of rice began in Australia towards the end of 19^{th} century .

Rice is now cultivated in almost all Asian countries consisting of India , China , Thailand , Japan , Burma and Taiwan. Over 85 % of the worlds production come from China , India , Bangladesh , Japan and Pakistan . Only a little percent of rice production comes from US , yet it is a rice exporting country

Rice is an extremely cultivated food crop in India occupying an area of over 42 million hectares (nearly 17% of the total area under cereal cultivation) India is 2^{nd} largest producer of rice with an annual production of 73 million tonnes of paddy in 1991 – 1992 .In India rice is grown particularly in all the states Maharashtra , Assam , Andhra Pradesh , Telangana , Kerala , Tamil Nadu , Orissa and other states also.

In India rice is sown at various times in different regions due to high variations in climatic conditions . Rice is a staple diet of over a third world's population . It is a starch – rich

food , eaten after boiling . It is also employed for making alcoholic beverages and as a source of starch and rice flour . Rice starch has wide industrial potential in cosmetic industries .

REVIEW OF LITERATURE :

Seed mycoflora of different rice varieties was extensively studied by Khan 2004 , Wahid et al 2001 , Rodricks 1976 reported several mycotoxins isolated from different varieties of rice seed . Bakan et al 2002 , Toth and Teren 2005 observed Aspergillus species , a common fungal contamination of cereals and also produces mycotoxins . Uma and E.g. Wesely 2013 . Five pathogenic fungi were isolated and identified from different varieties of rice seeds and identified based on their typical structure and basic characters as suggested by Barnett and Hunter (1972) . Reddy et al 2004 reported frequent flood and rainfall near harvest leads to panicle more prone to invasion by fungi .

The important seed borne pathogens of rice are *Pyricularia oryzae* , *Drechslera Oryzae* , *Fusarium moniliformi* , *Alternaria podwickiia* , *Ephelis oryzae* , *Tilletia barcleyana and Ustilagonoidea virens* . The percentage of infection varies from sample to sample , variety to variety and locality to locality with the environmental conditions .

High moisture supported maximum growth of moulds and caused loss in germeability . The conditions like rainfall relative humidity , temperature , seed moisture play very important role in establishment of seed mycoflora . Different types of seedling abnormalities are found to be due to the toxins of seed borne fungi in different crops .

AIMS AND OBJECTIVES :

- To study the seed borne fungal diseases of Rice / Paddy (Oryza Sativa L).
- To collect seed samples of different varieties of Rice from various regions of Telangana state .
- To assess seed mycoflora by employing various techniques as recommended by ISTA (International Seed Testing Association).
- Incubation of seed plate to find out seed mycoflora of Rice.
- Identification and isolation of seed borne pathogens .
- To study pathogenicity of seed borne pathogen .
- To analyze the results and produce the statistical data.
- To provide suitable control measures against seed borne pathogen of Rice on the basis of obtained results.
- To study the effect of bio control fungicides and medicinal plants in control of seed borne pathogen.

Hypothesis :

Based on previous research studies important seed borne fungi that cause diseases of the foliage , stem ,leafsheath , root , grain and inflorosence in rice are more than 50 species some of which were isolated from different test rice varieties , *Alternaria sp., Fusarium sp., Aspergillus sp., Curvularia sp., Penicillium sp and Rhizopus sp*.(T.W Mew and P Gonzales)

Four chemical fungicides namely antracal , topsin , mencozeb and derosal were used to investigate their effect on seed borne mycoflora of rice . Seed treatment with different fungisides exhibited insignificant effect on the occurrence of *Fusarium moniliforme and Alternaria sp* . Antracal completely stopped the growth of *Helminthosporium sp.,* and *Curvularia sp* .the other three fungisides markedly suppressed the growth of *Helminthosporium sp.* by 50% (A.R. Butt et al)

The present work is aimed to predict the best fungicide to control the deseases spread by seedborne mycoflora . This helps to develop the resistant varieties ,to educate the farmers about the control and management techniques and to supply the healthy seeds to farmers.

Material and methods :

The following instruments may be used in the present study as per requirement.

- Auto clave for sterilization .
- BOD incubator for incubation.
- Compound microscope for identification of mycoflora.
- Hot air oven for glass ware sterilization .
- Laminar air flow for isolation and purification of mycoflora.
- Electronic digital balance for weighing.
- Forceps , needles , blades , knives and scalpel.
- Spirit lamp for sterilization .
- Microwave oven for melting of media.
- Growth chamber .
- Stereo – Binocular microscope for studying the habit characters.
- Micro pipette .
- Centrifuge .

Collection of plant material / Seed samples :

The methods describes by Neergard (1973) and Agarwal (1976)have been adopted for the collection of Paddy (*Oryza sativa L*), seed samples from different regions of Karimnagar district , Telangana . Accordingly , seed samples are collected from fields , store houses ,Prof. Jaya Shankar Agricultural University and market places of half kg each sample packets in the month of September to March .A composite sample bag was prepared by mixing the individual samples together and preserved in jute bags at laboratory temperature during the studies .

Assessment of seed mycoflora :

The seed borne fungi of rice would be detected by Agar plate and blotter test method as recommended by International Seed Testing Association (ISTA 1966) . The procedure of Agar plate and blotter test method is described by earlier workers De Tempe (1970) , Neergard(1973) and Agarwal(1976).

Identification and Isolation of seed borne fungi :

For the standard blotter test method untreated seeds and seeds after treatment with 0.1 % sodium hypochlorite for 10 minutes were placed on three layers of moistened blotter , 10 seeds per Petriplates . The plates were then incubated in B O D incubator at room temperature 27 ± 2°C for under 12 hours alternating cycles of light and darkness for eight days . Thus the exposed seeds were examined on the 9^{th} day under stereo binocular microscope for the presence of seed borne mycoflora . The fungi occurring on each and every seed to be identified on the basis of sporulation and morphological characters by observing under microscope with the help of manuals . The pure culture of the identified fungi are to be prepared and maintained in PDA (potato dextrose agar medium) slants and media used to isolation studies . Untreated seeds were used as controls . All experiments were carried out by triplet set (Narayan.M.et.al) .

The plant material should be screened for anti fungal activity of agar disk diffusion method (Perez.et.al.;1990) with the cultures of forty eight hours old grown on potato dextrose agar will be used for inoculation of fungal strain on PDA plates .

PLAN OF WORK :

- **I year –** Collection of seed samples of different varieties of Rice / Paddy from different regions of Telangana.
- **II year –** Incubation of seeds , isolation of pathogen and study of pathogenicity.

➢ **III year –** Compilation of results and produce the statistical data of research work.

RESULT AND DISCUSSION :

The result of different studies on Rice , seed health evaluation and discussion to be done and prepare statistical data . Identifying the characters of detected mycoflora .

CONCLUSION :

Fungicidal treatment of Rice seeds reduce the frequency of seed borne mycoflora and their by increase the seedling vigor .

Suggestions for future research work :

- Seed health evaluation need to be conducted at regular intervals on all the important Rice varieties .
- For increasing the detection efficacy modification in detection methods to be done .

REFERENCES :

- Barnett , H.C and Hunter S.B 1972 . Illustrated genera of imperfect fungi Minneso Burgess pub-P-241.
- Butt AR, Yaseen SI and JAvaid A. Seed borne mycoflora of stored rice grain and its chemical control. J Animal & Plant Sci 2011, 21: 193-196.
- De Tempe (1970) , methods of finding and identification of pathogens in seeds ,plant breeding and seed science 2002 Vol.46 no.1
- Dr. K Madhava Shetty ,K. Sivaji , K.Tulasi Rao (Flowering Plants of Chittoor District A.P ,India 2008.)
- Halt , 1994 Aspergillus flavus and aflatoxin B1 in flour protection . EUR. J. Epidermiol,10(5) :555-558.
- ISTA (International Seed Testing Association).1993. international rules for seed testing.Rules amendments seed sci. Technol.29:1-127
- Javaid, M.S.,A. Wahid, M.Idrees, M.A. Gilland A.Saleem(2002). Seed mycoflora studies in rice. Pakistan J . Phytopathol.14: 132-134.
- Khan , T.2 , Gill , M.A and Khan M.G.2000seed borne fungi of Rice from central Punjab and their control , Pak J. Phytopathol .12:12-14
- Narayan M. Ghangaokar and Ayodhya D , Kshirsagar – study of seed borne fungi of different legumes ,trends in life sciences and international peer reviewed journal.

- Neergard(1973) and Agarwal Seed pathology. The McMillan Press Ltd England 1079.
- Reddy C.S. , Reddy K.R.N , Kumar R.N , Laha G.S and Muralidharan K (2004) , - Exploration of aflatoxin , contamination and its management in Rice J. Micol.Pl Pathol. 34 (3) : 816-820
- Rodricks J.V.1976 : Mycotoxins and other fungus related food problems Advance in chemistry , series 149.American chemical society Washington P.23
- T.W.Mew and P.Gonzales – A hand book of rice seed borne fungi.IRRI – Science Publishers (2002)
- Uma V and E.g Wesely 2013 seed borne fungi of Rice from south Tamil Nadu J.Aad.Indus.Res.Vol.1(10).